

1.2 Cell Structure and Organisation - Answers

1.

(a)	<p>Drawing of a reasonable quality.</p> <p>Any four labels from: Outer membrane/inner membrane / double membrane; Inter-membrane space; Crista(e); Stalked particles; Matrix; Loop of DNA / circle of DNA (not: plasmids); (Small) ribosomes.</p>	<p>1</p> <p>4</p>
(b) (i)	<p>Synthesis of ATP / release of energy / respiration. (not: production of energy)</p>	1
(ii)	<p>Liver / nervous tissue / muscle / other suitable examples. (allow: pancreas; not: skin)</p>	1
(iii)	<p>Link with (ii)- active synthesis of proteins / active transport / muscle contraction – all require lots of ATP. Link with energy required. Allow reasonable explanation e.g. cell division even if (ii) unacceptable.</p>	1
		[8]

2.

(a)	<p>Prokaryotic</p> <p>Eukaryotic</p>	2
(b)	<p>A = Mesosome</p> <p>B = Chromosome / DNA / nucleoid (not: genes)</p> <p>C = Plasmodesmata / cytoplasmic strands / plasmodesmosome</p>	3
(c)	<p>H is surrounded by a membrane / envelope, B is not. / H is surrounded by a double membrane, B is not. / H contains chromatin, B does not / H contains histones, B does not. / The DNA in B lies free in the cytoplasm, in H the DNA is not free. / Circular chromosome / H has a nucleolus, B does not. (not: not definite nucleus)</p>	1
(d)	<p>D = Photosynthesis / Conversion of light energy into chemical energy. (Accept trapping light energy.)</p> <p>E = Secretion / secretion of glycoprotein / secretion of protein / synthesis of steroids / making lysosomes / secretory vesicles / adding lipid to protein for export / add carbohydrate to protein for export. Packaging / transport qualified.</p> <p>F = Protein synthesis / Place for ribosome attachment / Transport system.</p> <p>G = ATP production / Energy production . (Accept respiration)</p>	4
		[10]

3.

/		
/	/	
/	/	/
/		
	/	/
	/	

1 mark per horizontal line

6
[6]

4.

b	i A nucleolus B mitochondrion;	2
	ii to allow (messenger) RNA molecules/ribosome (particles) to leave nucleus or molecules, e.g. proteins hormones, enter nucleus;	1
c	rRNA/ribosomes produced in A, form ribosomes/take up position(C) enzyme/proteins modified in F, packaged into or forms lysosomes/secretory vesicles (D)	2

5.

(A)	mitochondrion	1
	cell respiration/ATP production	1
	(not: energy production)	
(B)	cell wall	1
	confers rigidity/prevents bursting	
	(allow: middle lamella/cell adhesion/intercellular space)	
(C)	(not: intermembrane space/entry of materials)	1
	nucleolus	1
	(r-)RNA synthesis/assembles ribosomes	1
(D)	chloroplast	1
	photosynthesis/light trapping	1
		[8]

6.

- (a) A = Golgi 1
B = Mitochondrion 1
C = (Smooth) Endoplasmic reticulum. (not: ER) 1
D = ~~Cell~~ membrane / ~~cell~~ surface membrane / ~~plasmamembrane~~. 1
E = Cell wall. 1
F = Ribosome 1
- (b) Chloroplasts/grana/thylakoid;
Vacuole;
Starch grains;
Plasmodesmata;
Nucleus or associated structure e.g., nucleolus or chromatin;
RER/rough endoplasmic reticulum;
Tonoplast/~~vacuolar~~ membrane
(Max. 2) (No consequential error allowed) 2
- (c) Vesicles; (labelled)
~~from golgi~~;
~~migrate~~ to cell membrane; (movement indicated)
~~membranes~~ fuse;
~~exocytosis~~; (term required)
(Max. 3) (Diagram needed; unlabelled diagram, max 2) 3

[11]

7.

AVAILABLE

Ribosome mark scheme

- | | | | |
|-------|--|--|--------|
| (i) | 1 mark for decent diagram showing 2 clear subunits
1 mark for any label | large subunit
small subunit
groove which mRNA fits into
tRNA binding site | 2 |
| (ii) | RNA/Ribosomal RNA
Protein
(not: amino acids/nucleic acid) | | 1
1 |
| (iii) | (rough) endoplasmic reticulum | | 1 |
| (iv) | protein/polypeptide synthesis | | 1 |
| (v) | nucleolus/nucleolus and cytoplasm
(not: nucleus/cytoplasm) | | 1 |

Total 7 marks

8.

- | | | |
|-----|----------------------|---|
| (a) | protein/capsid | |
| | nucleic acid/DNA/RNA | 2 |

9.

- | | | |
|-----|---|--------|
| (a) | A. Granum | 1 mark |
| | B. Stroma | 1 mark |
| | C. Double Membrane/Inner & Outer Membrane | 1 mark |
| | D. Thylakoid or intergranal lamella | 1 mark |
| (b) | Chlorophyll | 1 mark |
| (c) | (Circular) DNA/Ribosome. | 1 mark |

Total 6 marks

10.

Available

- (a) (i) A = nucleolus;
B = ribosomes;
C = mitochondrion;
D = Golgi body/apparatus; (not: Golgi)
E = smooth endoplasmic reticulum; (not: SER) 5
- (ii) B;
A/C/D/E; 2 Max
- (b) (i) can see (detail of) mitochondria;
ribosomes;
Golgi body/apparatus;
nuclear envelope;
(not: can't see detail unequal) 2 max
- (ii) B for protein/polypeptide synthesis;
C for ATP production/energy release; 2 Max
[11]

11.

	Smooth endoplasmic reticulum	Mitochondria	Golgi body	Rough endoplasmic reticulum
Surrounded by a double membrane		✓		
Produces glycoprotein			✓	
Buds off lysosomes			✓	
Manufactures hormones and enzymes				✓
Most abundant at sites of active transport		✓		
Abundant in cells secreting lipids	✓			
Closely associated with ribosomes				✓
				(Total 7 marks)

12.

(a)	cell wall	✓	✓	X;	[6]
	vacuole	X	✓	X;	
	nuc mem	X	✓	✓;	
	chloroplasts	X	✓	X;	
	mesosomes	✓	X	X;	
	mitochondria	X	✓	✓;	

(b) (i) collection/number/many similar cells; [2]
working together/carrying out a function;

(ii) yes because many cells; Max [2]
identical in structure;
working together to move/raise forearm;
no because other tissues/blood vessels/nerves/ connective
tissue present;
therefore is an organ;

Total [10]

13.

- (a) A Outer membrane. (1)
- B. Inter membrane space. (1)
- C. Cristae. (1)
- D. Matrix. (1)
- (b) To increase the surface area (1)
- for carrying the maximum number of enzyme molecules/so more ATP (1)
can be produced.
- (c) ATP (1)
- (d) (i) Muscle cell. (1)
- (ii) Mitochondria are more abundant in cells with high
energy demand/muscle consumes more energy (than skin cells). (1)

Total 9

14.

- (b) A Cell wall, protection/ turgidity/ stop cell bursting/ support/shape [1]
(not: strength/structure)
- B Chloroplast, photosynthesis [1]
- C Plasmodesmata, movement of materials / symplastic or cytoplasmic flow/water movement [1]
(not: description e.g. cytoplasmic strands)
- D Vacuole, storage of materials / (cell) sap, keep cytoplasm pushed against cell wall/maintain turgor (not: contains water) [1]

- (b) Mitochondria, provide energy / ATP (for activation of amino acids)
- Ribosomes, translation of (mRNA) / join amino acids together/forms peptide bonds.
- Endoplasmic reticulum, Ribosomes attached / proteins secreted into it / movement of protein / secondary structure / reference vesicles pinching off which move to golgi.
- Golgi, assembly / packaging / quaternary structure / glycoproteins / membrane placed around them/ modification of protein.
- Cell membrane, absorption of amino acids / secretion of protein/exocytosis.
- Nucleus, mRNA / code for primary structure on DNA/DNA has genetic code.
- Nucleolus, makes (tRNA and) rRNA / makes ribosomes. [1 mark each (7)]

- (c)
- A = Ribosomes
- B = ER
- C = Golgi
- [1 mark per link]

- (d) (i) Cellulose [1]
- (ii) Starch accept amylose or amylopectin [1]
- (iii) Ribose (not: pentose sugar) [1]

15.

A = Golgi body;

storing / transport of lipids / assembling glycoproteins /
formation of lysosomes (**not**: vesicles) /
cell wall formation / insect cuticle formation.

[2]

B = rough endoplasmic reticulum;

translation / protein synthesis / packaging / form extensive
transport system throughout cell

[2]

C = nucleolus;

site of synthesis of rRNA / production of ribosomes;

[2]

[Total 6 marks]

16.

(a)

Structure	Name	Function
A	Mitochondrion	(Cell) respiration / ATP production
B	Chloroplast	Photosynthesis / light trapping
C	Ribosome	Protein synthesis

Independent marks

[6]

(b) they have been cut in different planes

[1]

(c) animal cells do not have chloroplast; cell wall; (large) (central) permanent
vacuole; centrioles; plasmodesmata

(not: chlorophyll) No need for comparative statements. [Any 2]

[2]

[Total 9 marks]

17.

(a)

Structure	Plant cell	Animal Cell
Centrioles	X	/
Mitochondria	/	/
Chloroplasts	/	X

(1 for each column)

[2]

(b) (i) Correct diagram showing double membrane with

Inner membrane folded.

[1]

Any 2 labels from matrix, crista, intermembrane space,

double membrane, stalked particles, DNA, ribosomes.

[2]

(ii) Aerobic respiration / ATP production (not: respiration)

[1]

(iii) Muscle cell / liver cell/sperm/pancreas/epithelial cell from small intestine/neurone/companion cell.

[1]

(iv) High requirement for energy for contraction/sperm movement / for chemical activity/high metabolic activity/active transport. (not: exercise)

[1]

[Total 8 Marks]

18.

	Structural feature	Function of feature
Organelle		ribosome manufacture / synthesis rRNA;
Mitochondrion;		<u>Increase surface area</u> for enzyme attachment /ATP synthesis/ oxidative phosphorylation;
Lysosome;		
	stack of cisternae / flattened (membrane bound) sacs	Protein assembly /conjugation of proteins / secretion / lysosome formation/ produces vesicles/packaging or modification molecules/ stores and transports lipids/stores and transports lipids

[Total 6 marks]

19.

- | (a) | Cell X | Cell Y | (3 max) |
|-----|---|--|---------|
| | Large number of vesicles
(not: lysosomes) | No/small number vesicles; | |
| | Large amount of RER/ribosomes | Little RER/ribosomes; | |
| | Few mitochondria | Large number of mitochondria; | |
| | No microvilli | Microvilli; (not: villi /membrane folds) | |
| | More nuclear pores
(not: ref. cell size) | Fewer nuclear pores. | |
| (b) | A = Transport substances to plasma/cell membrane;
B = Protein synthesis;
C = <u>ATP</u> synthesis (not: produce energy/ref. respiration). | | 3 |
| (c) | Exocytosis;

Transport vesicle fuses with plasma membrane;

Break in membrane to allow expulsion of secretion. | | (2 max) |

8 MARKS

20.

- | | | | |
|-----|------|--|-----|
| (a) | (i) | mitochondrion; | [1] |
| | (ii) | aerobic respiration / production / manufacture of ATP;
(not: make ATP for respiration) | [1] |
| | (ii) | A = cristae;
B = matrix; | [2] |
| (b) | | metabolically active/ many chemical reactions or specified eg active transport
large amount of ATP produced/required; | [2] |

(Total 6 Marks)

21.

Feature	Prokaryotic	Eukaryotic
mitochondria	Absent (not: no organelles)	present;
Arrangement of DNA	circular/no chromosomes; (not: loop)	DNA forms chromosomes
Position of DNA	Free in cytoplasm	in nucleus/ bound by membrane;
Composition of cell wall if present	murein peptidoglycan (not: not cellulose)	cellulose/chitin;
Size of ribosomes	Small/70S; (not: other figures)	Large/80S;

1 mark per row

(Total 5 marks)

22.

- (a)** A = matrix;
B = crista/internal membrane; **2**
- (b)** E is the site of protein synthesis;
Polypeptide chains build up at ribosome;
transports polypeptides/proteins;
ribosomes read genetic code (allow: receive mRNA); **2 max**
- F buds off vesicles/package proteins into vesicles;
these contain molecules for secretion;
transport protein molecules to cell surface/membrane;
synthesis of glycoproteins/modification of proteins; **2 max**
- (c)** secretory cell involved in active processes/metabolically active;
ATP/energy dependent;
ATP manufactured by C;
hormone synthesis requires ATP; **2 max**
- (d)** cut in different plane/AW; **1**
- (Total 9 marks)**

23.

- | | | |
|---------|---|---|
| (a) (i) | Mitochondrion/ mitochondria | 1 |
| (ii) | Respiration/ aerobic respiration | 1 |
| | stores {energy/ ATP}/ release energy/ {synthesis/produce ATP}/ release energy / ATP for respiration =2 marks NOT production of energy | 1 |
| (iii) | muscle / liver/ epithelial cells of small intestine / cells of proximal convoluted tubule/ neurones/ companion cells/ sperm/ secretory cells NOT muscle tissue/ the liver/ cardiac tissue | 1 |
| (b) | A | 1 |
| (c) | allows transport of { <u>messenger/ mRNA</u> }/ nucleotides/ ribosomes NOT out and in | 1 |

(Total 6 marks)

24.

- | | | |
|---------|--|---|
| (a) (i) | Biosensor; | 1 |
| (ii) | Tissue; | 1 |
| (b) (i) | Prokaryotic has no nucleus vs eukaryotic has a nucleus / eukaryotic has membrane bound organelles vs prokaryotic no membrane bound organelles (Accept named membrane bound organelle) / prokaryotes smaller ribosomes (70S) vs Eukaryotes larger (80S) / DNA circular v DNA in chromosomes or strands [must refer to both terms];
Reject reference to cell wall;
Reject reference to size;
Reject reference to plasmid; | 1 |
| (ii) | Chloroplast contain chlorophyll vs mitochondria have no chlorophyll (accept photosynthetic pigments) / grana vs no grana / stroma vs matrix / cristae vs no cristae / thylakoid vs no thylakoids / cristae vs grana / infolding of membrane in mitochondria not in chloroplasts [must refer to both structures]; | 1 |

Question total 4

25.

(a)	<p>(i) A Mitochondrion/ mitochondria Plus ATP synthesis/aerobic respiration; NOT produce/ create energy</p> <p>B Golgi Body/ complex/ apparatus NOT golgi alone Plus one of</p> <ul style="list-style-type: none"> • Modification of {proteins/lipids}/ Addition of sugar chains/ produces glycoprotein • {Transport/storage} of {lipids/digestive enzymes} • Synthesis of {(secretory) vesicles/lysosomes}/ packaging proteins; <p>NOT transport(ation) of proteins/ synthesis of proteins</p>	2
(b)	<p>(ii) Liver/muscle/nervous tissue/ meristem;</p> <p>Nuclear pores + Allows {mRNA/ribosomal RNA/ribosomes} to <u>pass out/through</u> of nucleus; NOT substances</p> <p>Nucleolus + Synthesis of ribosome (components);</p> <p>(Double) nuclear membrane/nuclear envelope + Separates the DNA from the rest of the cellular contents/ holds DNA/ chromosomes;</p> <p>Chromatin+ condenses to form chromosomes/ {involved in/ code for} protein synthesis;</p> <p>Matched pair = 1 mark</p>	1
(c)	<p>D presence of ribosomes + no ribosomes on E; D {membranes/ cisternae} in parallel/regular lines/ more organised + {open network of <u>membranes/ cisternae</u>}/ less organised/ or description in E;</p> <p>Question 3 Total</p>	2
[7]		

26.

(a)

Organelle	Name	Function
K	nucleus;	contains <u>DNA</u> which {codes for / controls} <u>protein synthesis</u> ;
L	ribosomes ;	synthesise proteins;
M	Golgi apparatus/body;	packaging of proteins (for secretion from the cell) / (chemically) modifies proteins / produces glycoproteins / produces lysosomes;

6

(b) (i) They have been cut in different plane/ angle;

1

(ii) (Loop of) DNA;
(70S) ribosomes;
Both possess plasma membranes; NOT double membrane

Max 2

(iii) Mitochondria: (statements should be comparative)
Has a double membrane;
No cell wall;
No capsule;
No flagellum/ pili;
No mesosome;
No plasmids;

Max 2

Question 5 Total

[11]

Essays

1.

-
- | | | | |
|-----|---|--|-----|
| (b) | A | Mitochondrion has double/inner and outer membrane. | (1) |
| | B | Inter-membrane space. | (1) |
| | C | cristae/stalked particles. | (1) |
| | D | matrix. | (1) |
| | E | DNA/ribosome (in either mitochondrion or chloroplast). | (1) |
| | F | Self replicating (either mitochondrion or chloroplast). | (1) |
| | G | The function is energy release/ATP production/aerobic respiration. | (1) |
| | H | Chloroplast has double/inner and outer membrane. | (1) |
| | I | stroma. | (1) |
| | J | Flattened sacs/lamellae/thylakoids. | (1) |
| | K | (stacked to form) grana. | (1) |
| | L | sites of photosynthetic pigments/chlorophyll
e.g. grana, thylakoids | (1) |
| | M | Starch grains. | (1) |
| | N | Function is photosynthesis. | (1) |
| | O | Some attempt at genuine comparison. | (1) |
- (Maximum 10 from available 15)

Any 9 points plus point O.

Total = 10 marks

2.

Available

(b)	<u>RER</u>		
A	(internal) system of flattened sacs/cisternae/membrane compartments (Any 2)	1	
B	ribosomes attached	1	
C	site of/carry out protein synthesis/translation	1	
D	continuous with nuclear membrane	1	
	<u>Golgi</u>		
E	<u>golgi</u> consists of (interconnected) flattened (membranous) sacs	1	
F	<u>proteins</u> from RER are <u>transported</u> in (membranous) vesicles	1	
G	vesicles fuse with <u>golgi</u> membrane and contents are shed into <u>golgi</u> sacs	1	
H	they are built into more complex molecules such as enzymes/glycoproteins	1	
I	one other <u>golgi</u> function, e.g. carbohydrate secretion/transporting or storing lipids	1	
J	at the other end, vesicles containing product/lysosomes are budded off	1	
K	these can fuse with plasma membrane – exocytosis of contents	1	
	<u>Lysosomes</u>		
L	lysosomes are (membrane bound) vesicles/sacs, which contain digestive enzymes	1	
M	vesicles fuse with membrane of cell vacuoles and <u>enzymes</u> digest contents	1	
N	which have been previously enclosed by phagocytosis	1	
O	break down worn out organelles/cause autolysis	1	
	(Award a maximum of ten out of the fifteen marks available but if only two of the three organelles are discussed the maximum is eight)	[10]	

3.

- (a) A. Enclosed by a cell wall (1)
- B. Presence of cell membrane. (1)
- C. Ref. to one other structure from: pili, flagellum, capsule, slime layer, photosynthetic membrane. (1)
- D. DNA in tangled nucleoid/single chromosome / loop. (1)
(not: if looks like plasmid)
- E. Additional rings of DNA – plasmids / food reserve granules. (1)
- F. Infoldings of cell membranes – mesosomes. (1)
- G. Ribosomes lie free in the cytoplasm. (1)
- H. Ribosomes very much larger in eukaryotes. (1)
- I. Prokaryote cell 1-10µm; eukaryote 10-100µm (1)
- J. Cell wall of eukaryote is made of cellulose (1)
- K. Prokaryote cell wall murein/peptidoglycan. (1)
- L. Eukaryotes have a separate nucleus / nuclear membrane (1)
more genetic information.
- M. Containing several paired chromosomes / linear chromosomes. (1)
- N. Eukaryote compartmentalised internally by membranes / contains (1)
organelles.
- O. Eukaryote chromosomes have protein / histones. (1)
(Half marks only max: if eukaryote and prokaryote wrong way round / no diagram)

Total 10

4.

- (a) (i) A. chloroplasts found only in plant cells;
- B. mitochondria found in both types;
- C. chloroplasts carry out photosynthesis / use or contain chlorophyll, mitochondria aerobic respiration;
- D. mitochondria contain cristae;
- E. chloroplasts contain thylakoid / grana / lamellae / chloroplasts may contain starch grains;
- F. chloroplast has stroma,
- G. mitochondria has matrix;
- H. both found in cytoplasm;
- I. both have double membrane;
- J. both contains DNA;
- K. both possess folded internal membranes;
- L. for location of electron carriers / enzymes / increase surface area;
- M. both possess ribosomes;
- N. both self replicating;
- O. ref. to both involved in ATP production.

[5 Max]

[5 max]

[Total 10 marks]

5.

(a)	{	A	Nucleus;	1
		B	Contains DNA code for amino acid sequence;	1
			NOT genetic information alone;	
	{	C	Carries out transcription / makes RNA copy;	1
		D	Nucleolus;	1
	{	E	Makes ribosomes / organises transcription / makes rRNA;	1
		F	{ <u>Rough</u> ER / Ribosomes} { translate mRNA / put amino acids together / protein synthesis};	1
	{	G	Endoplasmic reticulum;	1
		H	Transports protein;	1
	{	I	(To) Golgi;	1
		J	Packages protein into vesicle;	1
	{	K	Modifies protein or description;	1
		L	<u>Secretory</u> vesicle;	1
	{	M	Vesicle migrates towards plasma membrane; (can award M and N if use vesicle instead of secretory vesicle)	1
		N	Vesicle fuses / merges with plasma membrane;	1
		O	Contents of vesicle emptied by <u>exocytosis</u> ;	1

Question total 10